



Mark Century* 120 Numerical Positioning Control

A packaged Mark Century two-axis system for
automatic operation of point-to-point machines

*Trademark of General Electric Company

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Mark Century 120

numerical positioning control

easily justified by any machine tool user

Mark Century packaged numerical controls are available in several models—each tailored to a special type or group of machines. The 120 control is a two-axis system for point-to-point machines, and there are other G-E packaged systems for machines with different control requirements such as turning, boring, and milling.

All G-E packaged controls come in one basic design with a number of pre-engineered options which can be added inexpensively for extra versatility. The user benefits from this packaged design concept because he gets a high performance N/C system on machines of his choice without paying for unnecessary features.

Furthermore, all G-E packaged controls are substantially similar in design and construction. This compatibility can reduce operating costs significantly where several are in use. Training expenses are less, and overall operating efficiency is improved because of similarities in programming and maintenance.

Since its introduction, the Mark Century 120 numerical control has gained wide acceptance and is offered with many types and brands of machines. The latest model of the 120 control, described here, incorporates a number of new features and improvements for added value to the user.

High reliability

Design standards and components for the Mark Century 120 control are of the same high quality found in all General Electric Mark Century controls. More than a decade of General Electric experience in designing and building numerical controls for over 100 machine-tool manufacturers backs up your assurance of reliability.

Input data is distributed, stored and acted on by solid-state circuitry. These transistorized, printed circuits—carefully designed and manufactured—give you performance and reliability you can depend on.

And because the control is machine-matched and thoroughly checked out operationally before it is delivered, installation at your plant is quick, simple.



Total service

General Electric has a full range of services available to users with machines equipped with the Mark Century 120 control. For example, specially trained G-E N/C service engineers from a network of over 50 offices are on call 24 hours a day.

This is only one part of the most complete service package found in the industry today. Other services available include:

- Training schools for your maintenance personnel
- Automatic check tapes for decoding circuits
- Unmatched product warranties
- Local stocks of replacement parts
- Complete service and instruction manuals
- Printed circuit board exchange plan
- Computer software support
- World-wide maintenance service



G-E engineers on call ready with technical assistance.

The Mark Century 120 control is designed for use on machines requiring automatic control of two motions, linear or rotary. Controlled simultaneously or sequentially, each motion has its own separate servo drive for point-to-point positioning.

Simplified programming

Binary-coded decimal data input is provided with standard EIA, 8-channel punched tape. Compatible with all conventional tape-producing facilities, the binary-coded decimal format simplifies programming.

Plus and minus programming capability permits four-quadrant machining in one set up.

Variable-block word address format means you don't have to program repetitive information in each block of data—just add the new data. This format produces shorter tapes and reading times, resulting in simplified and accurate operation.

Manual data input, as an option, is a valuable tool for set-up and prototype operations.



Functionally arranged panel controls provide utmost convenience and flexibility.

Maximum flexibility

Unmatched optional features add convenience and flexibility to the Mark 120 control. You get operator ease by using functionally arranged push buttons and switches—flexibility through extra functions which can be added. They include:

- Manual data input
- Sequence number readout
- Steering-milling control
- SCR servo drive control
- Accupin* linear position feedback
- Electro-hydraulic servo drive control
- Tape reader with take-up reels

A protected photoelectric tape reader provides fast, reliable operation. Proportional d-c servo drives, with silicon-controlled rectifiers or electro-hydraulic drives give the machine fast hole-to-hole positioning time.

Compact, easy to maintain

A modern NEMA 1, pressure ventilated, floor-mounted enclosure contains all control components. Machine/control connections are made with plug-in connectors, and swing-open gasketed doors provide easy access to all parts of the unit.

Plug-in printed circuit boards, clearly identified by type and plug-in receptacles, make board changing easy and foolproof. A check tape and condition indicator boards speed checkout of the control reading and data storage circuits.

The compact Mark Century 120 positioning control measures only 28 inches wide, 22 inches deep, and 45¾ inches high. It operates on standard 230-volt, 60-cycle power with a $\pm 10\%$ voltage variation permissible.

Control transformers are available for operation with other conventional 60 and 50 cycle voltages.

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Standard Features

Plus and Minus Programming—Allows the X and Y motions to be programmed on either side of the zero reference which has been established.

Absolute Data Input—The Mark Century 120 positioning unit provides control of two axes simultaneously with a maximum command of ± 99.9999 inches of each axis. The command input is in absolute dimensions.

Resolution—Minimum input dimension is 0.0001" permitting highly accurate machine operation.

Servo Drives—SCR motor ratings from 1/50 horsepower to 1 horsepower are available. These smaller motor sizes open up new application possibilities.

Straight-line Milling—Truly proportional d-c servo drives permit milling along any machine axis. Milling feed rate

over a 100:1 range can be easily controlled by the operator with a convenient panel-mounted potentiometer.

Zero Offset—Makes it possible to locate the zero point of the control system at any point on the machine table for added set-up flexibility.

Backlash Take-up—Positioning is more accurate because effects of backlash, windup or other lost motion of the machine are eliminated. A backlash take-up circuit for each motion provides for final positioning from the same direction regardless of the previous position.

Rotary Resolver Feedback—Provides precise correspondence of command signal and machine-tool position.

Machine-mode Selection—Mark Century 120 controls can be operated in three modes:

Automatic—All machine com-

mands come from programmed tape.

Semi-automatic—(Optional) Machine operates from commands entered by operator on manual-data-input panel.

Manual—Right-left, in-out jog switches permit servo operation of each machine axis under manual control.

Broad Range of Auxiliary Functions—As part of the standard control, 99 miscellaneous functions are available to the machine builder. This built-in flexibility means the machine you buy has a full range of auxiliary operations that can be programmed, including feeds, speeds and depth stops, tool selection, and other assigned functions.

Optional Features

Full two-axis positioning capability is provided with the standard features of the Mark Century 120 control. Optional features are provided for those applications requiring these capabilities.

Manual Data Input—Enables the operator to duplicate from the console all input information that can be provided from tape. This option is particularly valuable for set-up and prototype work.

Sequence Number Readout—This display indicates the operation being accomplished by the machines, and provides a reference to the operator

for initiating certain manual operations such as tool or gear change. It also gives him the ability to locate and repeat any particular machine sequence.

Choice of Servo Drives—Silicon-controlled rectifier servo drives rated up to one horsepower can be furnished. For larger machines, electro-hydraulic servo drives are available optionally at no increase in price of the basic control unit. These hydraulic servo drives contribute to the efficiency of such high speed applications as punching machines.

Steering-milling Control—Allows rough milling under manual operation. The

operator sets the desired milling feed and, with the steering control, determines the direction of feed. Accuracy of the path depends on the mill feed rate and the skill of the operator.

Accupin Linear Transducer—Provides direct measurement of machine-tool position independent of rack and pinion or lead screw.

Take Up Reels For Tape Reader—Provides reader with greater tape handling capability. 4½ inch diameter reels can accommodate up to 200 feet of tape.

No matter what your performance requirements may be, there is a Mark Century numerical-control system to fit your needs. See your G-E Sales Engineer or machine-tool builder's representative for more information about Mark Century control systems, including the new Mark Century 120 positioning control.

Specialty Control Department, Waynesboro, Va.

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